Second Mid Term F88 Chem 130A Wemmer

1. For the reaction belox at pH 7 and 25°C, the standard half cell voltages are:

$2H^+ + 1/2\ O_2 + 2e^- \rightarrow H_20$ $E^{o'} = 0.820V$ and
$2H^+ + \text{cystine} + 2e^- \rightarrow 2\ \text{cysteine}$ $E^{o'} = -0.340V$.

a. Write the balanced reaction which will be spontaneous when these half cells are connected. If the second half cell is made with 0.1M cystine and 0.1M cysteine both present, what will be the cell potential and ΔG for the overall reaction under these conditions?

b. The cell voltage was also measure at 45°C, and the cell potential found to have decreased relative to 25°C by 0.0121V. What are the values of ΔH and ΔS for the reactions in the cell?

c. If the pH in both cells was decreased by two units would the cell potential increase of decrease (why)? If the pH in just the cystine/cysteine half cell were decreased, what would happen?

2. A galvanic cell is made at 25 °C with 1M solutions of Fe^{3+} and Fe^{2+} with a platinum electrode on one side, and a saturated solution of AgCl with a Ag electrode on the other side. AgCl has a solubility product of 1.8×10^{-10} at 25 °C.

a. Use the data above and that in Table 4.5 to calculate the cell voltage which would be measured.

b. If 0.01M $NaClO_4$ is added to the silver side (assume Na and $AgClO_4$) are soluble and that perchlorate is nonreactive), what will be the change in the cell potential?

c. When NH_3 is added to AgCl it dissolves to form $Ag(NH_3)2^+$. If NH_3 is added to the silver half cell in which direction would you expect the cell voltage to change if at all (explain your answer)?

4. Glycine/Valine Mutation question from problem set 6.